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the other on September 14, that are nearly in the correct focus, and which show a considerable amount of fine detail. Some difficulty was experienced with the Thornton–Pickard exposing shutter, which has not yet been entirely overcome.

Since the appearance of the great group, September 3–15, several other groups of smaller, but still very considerable dimensions, have been seen, so that the present revival of activity has been by no means confined to a single group. The two principal passed the central meridian on October 28 and November 5 respectively.

The figures given for 1898 are approximate only.

Observations of Planet (433) (1898 D Q) *made at the Royal Observatory, Greenwich, with the* 30-*inch Reflector of the Thompson Equatorial.*

(*Communicated by the Astronomer Royal.*)

Photographs of Planet D Q were obtained with the 30-inch reflector of the Thompson Equatorial by Mr. Davidson on 1898 September 20, September 21, September 23, October 3 and November 3. An attempt was made on November 1 to obtain a photograph with the Astrographic Equatorial, but nothing was shown with an exposure of 12^{m}, presumably because the planet's motion was so rapid (being about $50''$ an hour).

The exposures given were 20^{m} on September 20, 20^{m} on September 21, 15^{m} on September 23, two exposures of 10^{m} and 5^{m} on October 3, and an exposure of 20^{m} on November 3.

On account of the faintness of the planet (whose photographic magnitude is given by Professor Pickering as $12^{m}\cdot7$ about the middle of September) the reflector was used for these photographs as having more light grasping power than the 26-inch refractor, although the distortion of the field is greater.

In all the photographs the planet was photographed near the centre of the plate. Its position on the plate and those of from 14 to 16 comparison stars were measured in the duplex micrometer. As no *réseau* had been printed on the plates excepting on the plate of November 3, a plate on which a *réseau* had been printed was placed under the right hand microscope of the micrometer, and was used instead of a *réseau* on the plate.

The Right Ascensions and Declinations of the reference stars were taken from the Ottakring Zone Observations for the *Astronomische Gesellschaft Catalogue*, except in the case of B.D. $-5°$,5335 and B.D. $-5°$,5349, for which the positions were derived from the Karlsruhe Observations and the Radcliffe Catalogue. For B.D. $-6°$,5558, $-6°$,5567 and $-6°$,5568, the means of the Right Ascensions and Declinations given in the Ottakring Zones, the Radcliffe Catalogue for 1890, and the Karlsruhe Observations were taken.

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Standard co-ordinates were computed from these, which were compared with the measures and linear corrections of the form $ax+by+c$ and $dx+ey+f$ deduced, as in the reduction of the measures for the Astrographic Catalogue. The values of the constants for the several plates are as follows :—

	a	b	c	d	e	f
			int.			int.
Sept. 20	−·01232	+·01458	−0·1012	−·01606	−·01236	+0·8595
21	−·01227	+·01058	+0·1918	−·01130	−·01196	+0·4692
23	−·01254	+·01360	−0·4053	−·01461	−·01203	+0·5714
Oct. 3	−·01270	+·01504	−0·2479	−·01630	−·01238	+0·4729
Nov. 3	−·01253	+·01058	−0·8508	−·01081	−·01147	+0·5271

The values of c and f are arbitrary and depend on the R.A. and N.P.D. of the centre of the plate assumed in the computation of the "Standard Co-ordinates" of the stars. The unit in which c and f are expressed is a *réseau* interval, *i.e.* 5^{mm} representing 5′.

When the quantities a, b, d, and e are corrected for differential refraction and aberration, the values of a and e should be equal (giving the scale value), and the values of b and $-d$ should be equal (giving the orientation of the plate). The following values of the differences $a-e$ and $b+d$, corrected for differential refraction and aberration, are found—

	$a-e$.	$b+d$.
Sept. 20	+·00076	−·00158
21	+·00041	−·00072
23	+·00020	−·00111
Oct. 3	+·00040	−·00126
Nov. 3	−·00034	−·00023

It is assumed that these discordances arise from distortion of the field, the want of exact symmetry in the grouping of the stars about the centre of the plate, and the distance of the centre of the plate from the optical centre of the field.

With the values of the constants given above, corrections of the form $ax+by+c$, $dx+ey+f$, have been applied to the measured co-ordinates of the stars. The following table exhibits the residual differences of the measured and calculated positions of the different stars on the four nights, September 20, September 21, September 23, and October 3.

B.D. No.	Mag.	Assumed R.A. 1898·0.	Apparent Corrections to Assumed R.A.				Mean Corr.	Mean Residual.	Assumed N.P.D. 1898·0.	Apparent Corrections to Assumed N.P.D.				Mean Corrs.	Mean Resid.
			Sept. 20.	Sept. 21.	Sept 23.	Oct. 3.				Sept. 20.	Sept. 21.	Sept. 23.	Oct. 3.		
°		h m s	s	s	s	s	s	s	° ′ ″	″	″	″	″	″	″
−6 5538	9·3	20 32 50·93	...	...	0·00	+0·02	+0·01	...	96 16 31·7	...	...	−0·5	+0·7	+0·1	...
−5 5335	6·5	33 42·87	...	...	...	0·00	0·00	...	95 17 16·6	...	...	...	+0·6	+0·6	...
−6 5545	8·5	33 45·22	0·00	0·00	+ ·03	+ ·05	+0·02	±·020	96 30 57·9	+0·4	−0·2	+0·6	+0·1	+0·2	±·28
−6 5546	7·7	33 52·52	− ·05	− ·06	·00	+ ·02	−0·02	·033	96 33 1·2	+1·8	+0·8	+1·0	+0·6	+1·1	·40
−6 5550	8·9	34 46·13	− ·08	− ·04	− ·08	− ·07	−0·07	·013	96 12 22·6	−0·3	−0·2	−0·2	−0·5	−0·3	·10
−6 5552	9·0	34 48·75	...	− ·03	− ·02	− ·05	−0·03	...	96 9 28·3	...	−0·2	−0·1	−0·7	−0·3	...
−6 5551	9·5	34 48·82	+ ·04	+ ·12	+ ·06	...	+0·06	...	96 39 49·5	−0·8	−0·8	−0·9	...	−0·8	...
−6 5558	7·6	35 59·61	− ·02	− ·03	− ·01	+ ·01	−0·01	·013	96 21 38·2	+0·3	0·0	+0·3	−0·1	+0·1	·18
−7 5378	8·6	36 19·35	+ ·02	+ ·05	+ ·01	+ ·01	+0·02	·013	96 51 56·6	0·0	+0·3	−0·3	−0·6	−0·1	·30
−6 5560	9·3	36 33·45	+ ·09	+ ·13	+ ·11	+ ·07	+0·10	·020	96 14 15·5	−1·1	−0·9	−0·8	−1·0	−1·0	·10
−5 5349	7·8	37 6·33	− ·09	− ·12	− ·02	− ·04	−0·07	·038	95 39 38·2	+2·3	+1·1	+1·6	+1·3	+1·6	·38
−6 5564	8·9	37 33·33	− ·01	·00	− ·01	− ·01	−0·01	·003	96 43 55·7	+0·1	−0·2	−0·1	−0·1	−0·1	·08
−6 5566	8·6	37 59·34	+ ·01	− ·03	− ·04	− ·04	−0·03	·015	96 35 26·3	−1·1	−0·9	−0·3	−0·2	−0·6	·38
−6 5567	8·0	38 29·05	+ ·05	+ ·06	·00	− ·01	+0·03	·030	96 19 15·8	−0·3	0·0	+0·1	+0·3	0·0	·18
−6 5568	7·0	38 32·83	+ ·09	+ ·04	+ ·02	+ ·06	+0·05	·023	95 57 28·2	−1·1	−0·9	−1·4	−1·6	−1·3	·25
−6 5570	9·0	38 57·83	− ·03	− ·02	·00	+ ·02	−0·01	·018	96 10 27·7	+0·5	+1·4	+1·1	+1·2	+1·1	·25
−6 5573	8·1	39 50·98	·00	− ·09	− ·03	− ·05	−0·04	±·028	96 31 37·3	−0·5	+0·5	0·0	+0·2	+0·1	±·30

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The means of the discordances, where there are four observations, are $\pm 0^{s}{\cdot}0202$ and $\pm 0''{\cdot}245$.

The probable error of one determination is therefore

$$\pm 0^{s}{\cdot}0202 \times \sqrt{\frac{4}{3}} \times {\cdot}84 \text{ for the R.A.}$$

and

$$\pm 0''{\cdot}245 \times \sqrt{\frac{4}{3}} \times {\cdot}84 \text{ for the N.P.D.}$$

i.e. the probable error of R.A. is $\pm 0^{s}{\cdot}019$ and of N.P.D. $\pm 0''{\cdot}24$.

Two measures were made of each star and four of the planet DQ. Hence it follows that the probable error of the position of the planet would be

$$\pm 0^{s}{\cdot}019 \times \frac{1}{\sqrt{2}} = \pm\ .\ 0^{s}{\cdot}013 \text{ in R.A.}$$

and

$$\pm 0''{\cdot}24 \times \frac{1}{\sqrt{2}} = \pm\ .\ 0''{\cdot}17 \text{ in N.P.D.}$$

But as the planet was near the centre while the reference stars were distributed over the plate, it may be expected that the actual probable errors of the planet's position would be much smaller. These probable errors do not include the probable errors in the assumed places of the reference stars.

The following table gives the assumed places and residual differences of the reference stars used in the reduction of the photograph taken on November 3.

The assumed star places were taken from the Karlsruhe observations except for B.D. − 5°,5452, which was taken from Schjellerup's Catalogue for 1865.

B.D.	No.	Mag.	Assumed R.A. 1898·0.	Apparent Corr. to Assumed R.A.	Assumed N P.D. 1898·0.	App Corr. to Assumed N.P.D.
			h m s	s	° ′ ″	″
−4	5332	8·0	20 55 48·75	+0·02	93 50 20·2	+1·9
−4	5337	7·3	56 19·52	−0·01	94 31 54·3	−1·7
−5	5440	8·0	56 30·25	+0·09	95 3 57·4	−0·2
−5	5452	9 1	59 23·33	−0·12	95 13 34·8	+0·2
−4	5355	7·0	21 0 10·96	+0·03	94 46 6·4	+0·1
−4	5371	8·0	3 44·03	0·00	94 13 5·4	+0·2
−4	5372	7·8	3 59·15	−0·02	94 18 24·3	−0·1

To the Right Ascension and North Polar Distance of the planet determined directly from the measures corrections to reduce a star in the position of the planet from mean to apparent place were applied, as in the computation of "Standard Coordinates," mean places of the stars were used.

The following table gives the Greenwich mean time, corre-

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sponding to the middle of the exposure, the Right Ascension and North Polar Distance of the planet.

Date. 1898.	G.M.T. h m s	Apparent R.A. h m s	Apparent N.P.D. ° ′ ″	Log Δ.	Light Time. m s	Corr. for Parallax R.A. s	Corr. for Parallax N.P.D. ″
Sept. 20	9 20 6	20 37 32·43	96 21 20·5	9·9400	7 14	+·08	−8·6
21	8 39 17	37 7·64	21 12·1	9·9430	7 17	+·01	−8·5
23	7 49 1	36 26·31	20 43·9	9·9492	7 23	−·07	−8·4
Oct. 3	7 58 14	35 59·45	13 59·3	9·9811	7 57	+·02	−7·8
Nov. 3	8 15 36	21 1 4·25	94 47 52·3	0·0747	9 51	+·16	−6·1

The resulting corrections to the Ephemeris given by Dr. Berberich in *Ast. Nach.* 3517 are :—

	R.A. s	N.P.D. ″
Sept. 20	+ 7·11	+ 9·1
21	+ 7·86	+ 9·9
23	+ 9·04	+ 10·5
Oct. 3	+ 16·94	+ 10·2

The accurate Ephemeris is not continued to November 3, the date of the last photograph.

An approximate ephemeris from October 4 is given by Dr. Berberich in *Ast. Nach.* 3521, the resulting corrections to which from the photograph on Nov. 3 are :—

	R.A. s	N.P.D. ′
Nov. 3	+ 52	− 0′6

Royal Observatory, Greenwich:
1898 *November* 8.

Observations of Comet i 1898 (Brooks), made at the Royal Observatory, Greenwich.

(*Communicated by the Astronomer Royal.*)

The following observations were made with the Great Equatorial (G. E.), aperture 28 inches, and the Sheepshanks Equatorial (S. E.), aperture 6·7 inches, by taking transits over two cross-wires at right angles to each other, and each inclined 45° to the parallel of declination. Magnifying power of G. E. 485, and S. E. 55.

1898.	Greenwich Mean Solar Time.	Obser-ver.	Instru-ment.	☄ − ✱ R.A.	Corr. for Refrac-tion.	Log. Factor of Parallax.	☄ − ✱ N.P.D.	Corr. for Refrac-tion.	Log. Factor of Parallax.	No. of Comps.	Apparent R.A. of ☄	Apparent N.P.D. of ☄	Comp. Star.
	d h m s			m s	s		′ ″	″			h m s	° ′ ″	
Oct.	31 6 41 48	L.	G. E.	+0 10·96	0·00	9·5839	−0 15·4	0·0	0·6689	3	...	...	*a*
	31 6 41 48	,,	,,	−0 12·31	0·00	9·5839	+0 7·8	0·0	0·6689	3	...	...	*b*
	31 6 47 15	,,	,,	−0 8·19	0·00	9·5892	−2 26·1	0·0	0·6747	5	17 7 42·88	59 14 43·4	*c*
	31 5 59 30	A. C.	S. E.	+1 48·81	0·00	9·5346	−0 24·2	0·0	0·6248	6	17 7 28·68	59 9 27·5	*d*
	31 7 50 11	C. D.	,,	−0 39·89	0·00	9·6256	−4 10·0	−0·1	0·7383	3	17 8 0·67	59 21 45·6	*e*
	31 7 55 42	,,	,,	+0 10·78	−0·01	9·6271	+5 11·6	+0·2	0·7433	3	17 8 1·84	59 22 21·3	*c*
Nov.	1 6 49 37	G. B.	,,	−1 20·45	0·00	9·5777	+0 26·6	0·0	0·6968	6	17 14 2·97	61 52 30·2	*f*
	3 6 46 2	A. C.	,,	+0 1·67	0·00	9·5537	+4 25·7	+0·1	0·7285	1	17 24 54·92	66 45 36·8	*g*
	3 6 46 2	,,	,,	−1 59·12	0·00	9·5537	−2 3·0	0·0	0·7285	1	17 24 55·41	66 45 42·1	*h*
	3 7 6 52	H. F.	,,	+0 5·49	−0·01	9·5713	+6 34·0	+0·1	0·7434	5	17 24 58·73	66 47 45·1	*g*
	3 7 6 52	,,	,,	−1 55·50	0·00	9·5713	−0 0·3	0·0	0·7434	5	17 24 59·03	66 47 44·8	*h*
	4 7 4 21	A. C.	,,	−2 3·65	−0·01	9·5621	+7 23·2	+0·2	0·7550	1	17 29 36·28	69 3 38·0	*i*
	4 6 6 40	H. F.	,,	−2 13·74	0·00	9·4963	+2 1·9	+0·1	0·7204	2	17 29 26·20	68 58 16·6	*i*
	4 6 40 43	G. B.	,,	−2 9·32	−0·01	9·5414	+4 50·5	+0·1	0·7406	3	17 29 30·61	69 1 5·2	*i*
	6 5 40 58	H. F.	,,	−0 36·84	0·00	9·4481	+2 37·1	+0·1	0·7402	6	17 37 25·82	73 7 11·0	*k*
	8 5 47 50	A. C.	,,	+3 17·22	0·00	9·4541	−3 14·2	−0·1	0·7700	6	17 44 9·28	76 53 0·5	*l*
	10 5 36 20	,,	,,	+0 36·34	0·00	9·4333	+2 4·5	+0·1	0·7886	6	17 49 43·01	80 13 36·5	*m*

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